



THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD
OF PATENT APPEALS AND INTERFERENCES

Applicant : J. Richard Aylward, et al. Art Unit : 2644
Serial No. : 09/735,123 Examiner : Andrew R. Graham
Filed : December 12, 2000
Title : PHASE SHIFTING AUDIO SIGNAL COMBINING

Mail Stop Appeal Brief - Patents

Hon. Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY BRIEF

With Appellants:

I. MANIFESTLY, THE SPECIFICATION COMPLIES WITH THE WRITTEN DESCRIPTION REQUIREMENT FOR CLAIMS 1, 11 AND 14 RECITING "SAID SHIFTING IS CONSTANT" AND "SHIFTING BY A CONSTANT PHASE ANGLE" AT LEAST BECAUSE CONSTANT PHASE SHIFTERS WERE WELL KNOWN TO THOSE SKILLED IN THE ART AT THE TIME THE APPLICATION WAS FILED, THE DESCRIPTION SPECIFICALLY MADE REFERENCE TO THE RELATIVE PHASE SHIFTS BEING UNIFORM, IDENTIFIED A SPECIFIC ANGLE OF 90 DEGREES AND DISCLOSED A SPECIFIC EMBODIMENT WITH A CONSTANT PHASE SHIFT OF 90 DEGREES.

The Examiner Answer states:

Claims 1-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The detailed statement of said grounds of rejection is hereby incorporated from the final office action, mailed 7/13/2004. P.3.

...

On page 3, lines 14-18, the applicant has stated, "CLAIMS 1-23 MEET THE WRITTEN DESCRIPTION REQUIREMENT OF 35 U.S.C. 112 FIRST PARAGRAPH AT LEAST BECAUSE PAGE 3 OF THE WRITTEN DESCRIPTION DISCLOSES THE RELATIVE PHASE SHIFTS CAN BE NONUNIFORM OR UNIFORM AND PAGE 6 OF THE WRITTEN DESCRIPTION DISCLOSES A SPECIFIC CONSTANT PHASE SHIFT OF 90 DEGREES". The applicant further states on page 4, lines 19-25, "The sentence

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beginning at line 29 of page 3 reads, 'the relative phase shifts can be non-uniform or uniform according to a pattern, for example, by shifting each channel by i $(360/n)$ degrees (where $i=0$ to $n-1$, or $i=1$ to n)" and "The sentence beginning on line 23 of page 6, of the written description reads, 'With regard to the invention, if the phase shift difference applied by the circuitry is 90 degrees, the resultant combined signal consists of two components with a phase difference of 90 degrees, regardless of whether the two input signals were in phase or out of phase before being combined".

Considering these citations, the examiner yet respectfully submits that the patent specification does not describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention, as particularly specified in Claims 1, 11, and 14. The specifically unsupported limitations in these claims remain "said shifting is constant" and "shifting by a constant phase angle" as recited in the final rejection. "Constant" shifting is not supported by the present specification, including the above citations presented by the applicant. For a value to be "constant" it must be considered relative to a changing or variable value, such as time, amplitude, or frequency. The applicant's arguments clearly indicate that the nature of the "constant" shifting in the present claims is relative to the frequency of the signal to which the shifting is applied. On page 12, lines 23-30 of the applicant's response submitted 4/22/04, which was included with an amendment adding the above cited claim language, the applicant stated:

At least because the reference fails to disclose the substantially constant phase shift called for by all the claims, the reference can not anticipate the claims as amended. As the Examiner has observed, the reference discloses using time delay. Using time delay to introduce phase shift as shown in FIG. 2, induces phase shift that is a function of frequency (col. 4, lines 35-41). An advantage of the claimed invention calling for substantially constant phase shift is the especially desirable property of producing a similar boost in the output, regardless of the phase and correlation relationship of the input signals as explained on page 6, lines 14-16 and 23-29 of the specification.

Thus, at least virtue of the applicant's juxtaposition of the acknowledgement that the previously applied reference induces phase shift that is function of frequency and then contrasts the claimed advantage as calling for a substantially constant phase shift, the word 'constant' in claims 1, 11, and 14, is interpreted to mean 'constant' as a function of frequency. It, again, is particularly noted that the applicant presented arguments in the above passage in terms of "substantially constant". However, the pertinent claim language recites "constant", which though similar, is not granted the same definition as "constant". In the present appeal brief, the applicant has also referred to "the substantially constant phase shift called for by all these rejected claims" on page 9, lines 15-16, but

again, it is respectfully submitted that the claims do not call for 'substantially constant' phase shift, but rather, 'constant' phase shift.

The present application appears arguably to have support for a 'substantially constant' limitation, as Figure 5a illustrates a relative phase shift of up 50° from a base frequency shift of 60°. Such frequency-relative shifting is also noted on page 6, lines 8-13 of the applicant's specification. Again, however, such a characteristic is not sufficiently conveyed in the claim language of a "constant" phase shift.

In general sense of the present, [sic] the phase shift applied to a particular signal can be described in terms of a variety of characteristics, at least two of which are (a) the phase shift of the signal relative to another signal and (b) the phase shift of the signal as a function of the frequencies represented in the signal. As discussed above, it is respectfully submitted that the interpretation of the word "constant" in claims 1, 11, and 14 pertains to the latter of these characteristics. However, the passages cited by the applicant as providing adequate support for such limitations pertain to the former of these two characteristics. Shifting each signal according to a uniform or non-uniform pattern, as recited in the first cited passage, provides support for a relative phase shift between signals, but does not disclose that the phase shift applied individually to each channel is imparted as a function of the frequency of the respective channels. Shifting each signal with a phase difference of 90°, as recited in the second passage cited by the applicant above, also provides support for a relative phase shift between signals, but also lacks a teaching that explicitly, implicitly, or inherently discloses that the phase shift applied individually to each channel is constant as a function of the frequency of the respective channels. The particular degrees included or implied in each of these passages are considered analogous to the central frequency disclosed in page 6, lines 2-4 ("90 degrees" in the sentence: "Generally it is desirable to have signals in the frequency range of interest to be relatively phase shifted by between 60 and 120 degrees, and to have most in the frequency range relatively shifted by close to 90 degrees"). The degrees in these cited passages by the applicant, do not however, express, imply, or inherently substantiate the characteristic that, for example, all frequencies in the frequency range of interest are shift exactly to such a central frequency, as is generally represented in the pending claim language.

In fact, it is respectfully submitted that both of these passages are, at best, silent with regards to what value or property the phase shift may be 'constant' as a relative function of. Shifts are disclosed, but no function relating these shifts to another variable with a potential for change, such as frequency or time or signal amplitude, is presented.

Thus, it is respectfully submitted that the rejection of Claims 1-23 under 35 U.S.C. 112 it paragraph is proper, as respectfully requested to be hereby affirmed.

For purposes of clarity, it is further noted that the quotation on page 4, line 3 contains a typographical error. The final rejection recited on page 3, lines 17 recited the phrase "less than 10°, or 0°", not "less than 10°, or 00" as listed in the appeal brief. Pp. 4-8.

The final office action is reproduced in the brief. Brief Pp. 3-4.

"He may begin at the point where his invention begins, and describe what he has made that is new, and what it replaces of the old. That which is common and well known is as if it were written out in the patent and delineated in the drawings." *Webster Loom Co. v. Higgins*, 105 U.S. 580, 586 (1881).

Manifestly, constant phase shifters were well known to those skilled in the art at the time the application was filed. For example, attached U.S. Patent No. 4,630,286, discloses in FIG. 2 constant phase shifter 106 as a single block supporting a conclusion that at least as early as its filing date of October 10, 1984 a constant phase shifter was known to those skilled in the art. We also enclose a copy of an article published in *Meas. Sci. Technol.* **8 673-675** in 1997 entitled "Quadrature phase shifter for audio frequency sine waves" that provides a 90-degree phase delay in the frequency range 10Hz to 10KHz. Interpreting the claims in the light of the description, it is apparent that the constancy is with respect to frequency.

The written description in the specification discloses:

The implementation of FIG. 6 is particularly suited to a digital signal processing 5.1 channel system for decoding matrix encoded signals. With matrix encoded signals, the surround channel signal is shifted in phase with respect to the left and right channel signals by -90 degrees. This signal is then added with the left channel signal and subtracted with the right channel signal such that it appears in the left and right channel signal shifted in phase by a relative 180 degrees. Because of the phase relationships of the channels in a matrix encoded system, the decoded, quadrature shifted, multi-channel signals are differentially combined at summer 16.

Referring now to FIG. 7a, there is shown a plot of phase shift vs. frequency for the embodiment of FIG. 6, with filter 18 1 having a pole at 8.376 Hz. and a zero at 8.376 Hz, filter 18 2 having a pole at -134 Hz and a zero at 134 Hz, filter 18 3 having a pole at 37.44 Hz and a zero at 37.44 Hz, and filter 18 4 having a pole at 599.17 Hz and a zero at 599.17 Hz. In the implementation of FIG. 6, which has multi stage all pass filters, the desirable phase shift of 90 degrees is closely realized over a wide range of frequencies. The frequency spacing in each path (filters 18 1 and 18 2, 8.376 Hz to 134 Hz, filters 18 3 and 18

4, 37.44 Hz to 599.17 Hz) are each a factor of about 16. Generally, an in path spacing of 16 gives the highest degree of accuracy of in path phase shift, while an in path spacing of greater than 16 applies the in path phase shift over a wider frequency range. The left to right side spacing (8.376 Hz to 37.44 Hz and 134 Hz to 599.17 Hz) are each a factor of 4.5. Generally, a left to right side spacing of 4 gives high accuracy of left to right difference in phase shift, and factors of greater than 4 furnishes the phase shift difference over a wider range of frequencies.

In addition to single stage or multistage all pass filters, the phase shift circuitry can also be implemented by circuitry implementing Hilbert transform functions. In commercial implementations, all pass filters may be preferable due to the simplicity of the circuitry. Single and multi stage all pass filters and Hilbert transform functions can be implemented using analog circuits, digital circuits, or microprocessors running digital signal processing software. P.7, line 13-p.8, line 9.

II. CLAIMS 1-17, 20, 22 AND 23 MEET THE CONDITIONS FOR PATENTABILITY AT LEAST BECAUSE THE PRIMARY, SECONDARY AND TERTIARY REFERENCES FAIL TO SUGGEST THE DESIRABILITY OF COMBINING WHAT IS THERE DISCLOSED TO MEET THE LIMITATIONS OF THESE CLAIMS, AND IT IS IMPOSSIBLE TO COMBINE THEM TO MEET THESE CLAIM LIMITATIONS.

The Examiner's answer states:

Claims 1-17, 20, and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson (USPN 4356349) in view of Griesinger (USPN 6683962) and Waller, Jr (USPN 5333201). The detailed statement of said grounds of rejection is hereby incorporated from the final office action, mailed 7/13/2004. P. 3.

...

On page 4, lines 26-28, the applicant has stated, "CLAIMS 1-17, 20, 22 AND 23 MEET THE CONDITIONS FOR PATENTABILITY UNDER 35 U.S.C. 103(A) AT LEAST BECAUSE THE PRIMARY, SECONDARY, AND TERTIARY REFERENCES FAIL TO SUGGEST THE DESIRABILITY OF COMBINING WHAT IS THERE DISCLOSED TO MEET THE LIMITATIONS OF THESE CLAIMS".

The examiner respectfully disagrees. It is respectfully submitted that these references both present motivation for the modifications provided therein, as well as at least suggest the claimed limitations.

Robinson at least teaches that the delays, which equate to phase shifts, are applied to the low frequency range of the signal to effect a subtle enhancement of the emanated sound (col. 2, lines 57-61).

In light of this low frequency enhancement, as was further detailed in the final rejection, the reference of Robinson at least did not clearly specify three

features of independent claim 1, (a) including the shift being applied from about 20Hz to about 500Hz, (b) the range of shifting being between about 60° and about 120° and (c) that the output signal was a bass frequency signal (interpreted to be a bass-frequency-range only signal).

In Robinson, the frequency range of the applied shift, ranges of 30Hz to 250 Hz, and higher than 250Hz were noted and about 30Hz to 2KHz were illustrated, line 52 of Figure 2 (col. 4, lines 29-41). The phase shift applied ranges from approximately 2° to 9° (col. 4, lines 29-41).

Griesinger teaches the application of a relative phase shift of 900, noting that such a relationship in the output sound field results in excitation of all room modes independently (col. 15, lines 5-28).

The frequency ranges of "about 20 Hz to 500Hz" are at least suggested by Figure 15, illustrating a shift from about 40 to 105 degrees in the frequency range of approximately 20 to 400 Hz. Such a degree and frequency range were at least considered to teach the shift being applied from about 20Hz to about 500Hz and the range of shifting being between about or substantially limited 60° and 120°.

Such excitation with the illustrated phase characteristic (Figure 16) at least increases apparent spaciousness of a playback room (col. 3, lines 22-31; col. 16, lines 34-58 and various places throughout the disclosure of Griesinger).

Thus, the reference of Griesinger at least suggests modifying the relative phase shift in the system of Robinson by 90° in order to, as disclosed by Griesinger, increase the apparent spaciousness of the sound field, wherein the claimed characteristics of such a modification are at least suggested by the teachings of Griesinger.

Regarding the third reference, Waller, the teachings of Griesinger include the use of a pair of full range or a set of dual subwoofer speakers (col. 1, lines 40-53). However, the teachings of Robinson were not considered to clearly suggest that a derived signal for a speaker may comprise only bass-frequencies, even though such a concept might be arguably suggested by the nature of the noted subwoofer speakers.

Waller details the use of low pass filters, including pairs of low pass filters, the output of which at least suggests the derivation of a bass frequency only signal. The motivation for incorporating the particular teachings of Waller is suggested based on the teachings of particularly Griesinger and the knowledge of one of ordinary skill in the art, wherein the appropriate frequency range signal for subwoofers is a low or bass frequency range signal. In view of the above response, it is respectfully submitted that these references collectively both at least suggest the claimed limitations as well as provide appropriate motivation for combining the pertinent teachings.

On page 9, lines 15-21, the applicant has stated, "The primary reference fails to disclose the substantially constant phase shift called for by all these rejected claims". On lines 22-25, the applicant continues, "The secondary reference does not overcome the shortcomings of the primary reference" and "Nor

does the tertiary reference". The examiner respectfully disagrees. First, as noted above, it is respectfully submitted that the rejected claims call for a "constant" phase shift, not a "substantially constant" phase shift. Regardless, the particular teachings of the applied references and how they at least suggest any such "substantially constant phase shift" as claimed, are presented in the above response. It is also further noted, that Griesinger teaches the use of 90° phase relationship, which at least parallels the teachings of passages cited by the applicant as providing adequate support for the term "constant" (col. 15, lines 10-14). Griesinger also teaches constant phase differencing (col. 15, lines 17-20), which also suggests the 'constant' nature of the pertinent limitations as claimed. As such, the applied references meet, at least by suggestion, the limitations of the rejected claims 1-17, 20, and 22-23. Accordingly, it is respectfully submitted that the above rejection under 35 U.S.C. 103(a) is proper, and requested that said rejection be hereby affirmed. Pp. 8-12.

The detailed statement of the grounds of rejection in the final office action are reproduced in the Brief. Brief Pp. 4-8.

We rely on the authorities set forth on pages 8-10 of the brief and the following authorities of the Federal Circuit Court of Appeals which the office is bound to follow.

We take this occasion to explain what precedents are considered binding in proceedings in the Patent and Trademark Office (PTO). Where the Court of Appeals for the Federal Circuit has addressed a point of law in a published opinion, the Federal Circuit's decision is controlling. Similarly controlling are decisions considered to be binding precedent by the Federal Circuit, i.e., decisions of the former Court of Claims and the former Court of Customs and Patent Appeals, as well as the former Customs Court. See *South Corp. v. United States*, 690 F.2d 1368, 215 USPQ 657 (Fed. Cir. 1982)(in banc); *Bar Zell Expeditors, Inc. v. United States*, 698 F.2d 1210, 1211 n. 4 (Fed. Cir. 1983). In those relatively rare cases where the Federal Circuit has not addressed an issue, but there is "authorized published" Board precedent, that published Board precedent is binding on panels of the Board and Examiners in the Patent Examining Corps. *Ex parte Holt*, 19 U.S.P.Q. 2d 1211, 1214 (BPA&I 1991).

"Although the Commissioner suggests that [the structure in the primary prior art reference] could readily be modified to form the [claimed] structure, '[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification.'" *In re Laskowski*, 10 U.S.P.Q. 2d 1397, 1398 (Fed. Cir. 1989).

"The claimed invention must be considered as a whole, and the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination." *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 U.S.P.Q. 481, 488 (Fed. Cir. 1984).

"Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under Section 103, teachings of references can be combined *only* if there is some suggestion or incentive to do so." *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984) (emphasis in original, footnotes omitted).

"The critical inquiry is whether 'there is something in the prior art as a whole *to suggest* the desirability, and thus the obviousness, of making the combination. [citing *Lindemann* with emphasis added.]" *Fromson v. Advance Offset Plate, Inc.*, 225 U.S.P.Q. 26, 31 (Fed. Cir. 1985).

Despite this obligation to follow these settled authorities, the Examiner's Answer fails to even mention any of these authoritative decisions which require a conclusion that the claims meet the conditions for patentability nor did the Examiner's Answer comply with our request to quote verbatim the language in the references regarded as corresponding to each limitation in each rejected claim and quote verbatim the language in the references regarded as suggesting the desirability of combining what is there disclosed to meet the limitations of these rejected claims. It is impossible to comply with this request.

III. CLAIM 21 MEETS THE CONDITIONS FOR PATENTABILITY AT LEAST BECAUSE THE PRIMARY, SECONDARY, TERTIARY AND QUATERNARY REFERENCES DO NOT SUGGEST THE DESIRABILITY OF COMBINING WHAT IS THERE DISCLOSED TO MEET THE LIMITATIONS OF CLAIM 21, NOR IS IT POSSIBLE TO COMBINE WHAT IS DISCLOSED IN THESE FOUR REFERENCES TO MEET THE LIMITATIONS OF CLAIM 21.

The Examiner's Answer states:

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson in view of Griesinger and Waller, as applied above, and in further view of Kuusama et al (USPN 6332026). The detailed statement of said grounds of rejection is hereby incorporated from the final office action, mailed 7/13/2004. P.3.

...

On page 10, lines 11-15, the applicant has stated, "CLAIM 21 MEETS THE CONDITIONS FOR PATENTABILITY UNDER 35 U.S.C. 103(A) BECAUSE THE PRIMARY, SECONDARY, TERTIARY AND QUATERNARY REFERENCES DO NOT SUGGEST THE DESIRABILITY OF COMBINING WHAT IS THERE DISCLOSED TO MEET THE LIMITATIONS OF CLAIM 21".

The examiner respectfully disagrees. The motivation for combining the primary, secondary, and tertiary references is recited and discussed above. Kuusama illustrates and discusses the use of a low pass filter arranged in a particular manner, at least suggesting the limitation upon which it is relied. The motivation is at least suggest by the references in terms of the knowledge of one of ordinary skill in the art, by whom it would have been recognized that low pass filtering of a signal prior to application of the signal to a subwoofer removes any improper frequencies from the signal, regardless

the source of such improper signals, including prior signal processing.

In view of the above response, it is respectfully submitted that these references collectively both at least suggest the claimed limitations as well as provide appropriate motivation for combining the pertinent teachings.

On page 11, lines 11-15, the applicant presents no further support. for the patentability of Claim 21, at least relying on the discussion of the patentability of parent Claim 14. As the rejection of Claim 14 has been addressed and supported in the above response, it is respectfully submitted that Claim 21 is also unpatentable over the above rejections, in view of the above responses.

Accordingly, it is respectfully submitted that the above rejection under 35 U.S.C. 103(a) is proper, and requested that said rejection of Claim 21 be hereby affirmed. Pp. 12-13.

The detailed statement of grounds of rejection of claim 21 in the final office action is set forth on pages 10 and 11 of the brief.

We stand on the reasoning advanced on page 11 of the brief. The Examiner's Answer did not comply with our request to quote verbatim the language in the reference regarded as corresponding to each limitation in claim 14 and quote verbatim the language in the three references regarded as suggesting the desirability of combining what is there disclosed to meet the limitations of claim 14, and it is impossible to combine the references to meet the limitations of claim 21 or quote language in the four references suggesting the desirability of combining what is there disclosed to meet the limitations of claim 21.

CONCLUSION

In view of the forgoing authorities and remarks and the authorities and remarks set forth in the brief, and the inability of the prior art, alone or in combination, to anticipate, suggest or make obvious the subject matter as a whole of the invention disclosed and claimed in this application, the decision of the Examiner finally rejecting claims 1-23 should be reversed. If the Board is of opinion that a claim may be allowed in amended form, the Board is respectfully requested to include an explicit statement to that effect and direct that appellants shall have the right to amend in conformity with such statement which shall be binding on the Examiner in the absence of new reference or grounds of rejection.

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Respectfully submitted,
FISH & RICHARDSON P.C.

Date: 6 December 2005

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Enclosures: Patent No. . 4,630,286 and Abstract



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 DESIGN NOTE

Quadrature phase shifter for audio frequency sinewaves

Luca Callegaro *et al* 1997 *Meas. Sci. Technol.* **8** 673-675 doi:10.1088/0957-0233/8/6/015


[PDF \(208 KB\)](#) | [References](#)

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Abstract. A quadrature phase shifter for sinusoidal signals is presented. The circuit provides 90° phase delay (within 1°) and unity gain (within 6%) in the frequency range 100 Hz to 10 kHz. It consists of a second-order lowpass current-controlled filter; the cutoff frequency is maintained equal to the input frequency with a frequency to current converter. In this way, the filter provides a 90° phase delay between input and output. The main feature of the phase shifter is the absence of internal feedback; this avoids the introduction of long settling time constants when the phase shifter is part of control loops and gives almost instantaneous (within a period) resettling of the 90° phase delay when amplitude or phase variations of the input signal occur.

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